

the questions discussed were—What are the most ancient traces of man in Sweden? and Is it possible to indicate the routes, during antiquity, through which the commerce in yellow amber went?

Baron Kurck opened the discussion by stating that he believed that the most ancient traces of man were to be found in the southern parts of Sweden, and that during the Stone Age men had gradually and slowly travelled northwards, which he thought was sufficiently proved by the fact that the rudest constructed stone implements were found in the south, and that they became more and more mixed with polished ones as you proceeded in a northern direction. The question was entered into with liveliness, and, among others, three of our countrymen, Franks, Evans, and Howorth, took an active part and ably sustained the reputation of Anthropology among British savans.

At the Monday's sitting, when a point of great interest was discussed, namely, the characteristics of the polished stones in Sweden, and whether it was possible to attribute the antiquities of this age to one people or to the coexistence of several tribes inhabiting the different parts of Sweden, the King honoured the Congress with his presence. It would appear, too, that he was interested in the speeches, as on a subsequent day he not only himself returned, but brought the Queen with him. The discussion on that occasion was fortunately even more interesting than on the previous occasion, for it was on the Bronze Age, and what were the analogies in the manners and the industry of the Swedish people at that time when compared with those of the same period in the other countries of Europe : also on comparing the Bronze Age with those which preceded it. On Tuesday the Congress visited Upsala (the Oxford of Sweden), and were received and entertained by the professors and students in a most novel and interesting manner. They met us at the railway station, the students all with their white caps on, and carrying the twelve white silk banners, with the embroidered arms and devices of their respective provinces upon them, done in gold and silk thread in a manner which it would be hard to find female fingers at the present day, even when stimulated by Cupid's dart, capable or willing to execute. The choir of students, which I am told is the best in Europe, sang a song of welcome, and then marched before us to the principal points of interest in the town, several times giving us brilliant examples of their vocal powers, especially in the cathedral. Our visit to Upsala was, however, not one entirely for amusement, but for instruction, and a few miles from the town was one of the largest of the country's tumuli, opened for our inspection. It was nearly 40 ft. high, and composed chiefly of sand, covered over with grass, looking like a little hill, but one at whose height and steep sides you would look twice before attempting to ascend. In this were found human remains and the bones of animals (burned) supposed to have been offered in sacrifice. Fragments of gold and iron were also discovered, and a coin, all of which lead to the belief that this tumulus is not more ancient than the fourth century. Another excursion was made on Thursday to the Isle of Björkö, where there is an ancient cemetery of 2,000 tumuli, each about 4 ft. or 5 ft. high, and from 12 ft. to 18 ft. in diameter. Within a couple of hundred yards from this is the site of the

ancient town ; nothing remains to tell of its site but the souvenirs which lie hid in its soil, which is called the "Black Earth," and is famous for its potatoes. Several trenches, 3 ft. deep and nearly 4 ft. wide, were run through the site of this ancient town, and several of the members of the Congress were fortunate enough to pick up articles of interest—fragments of very rude pottery, needles of bone, glass beads, fragments of iron, and an immense number of the bones of domestic animals, including those of the horse, ox, sheep, dog, cat, pig, as well as of birds. From the remains found here it appears this town must have existed at least up to the eighth century. Before the visit of the Congress to it were found several iron keys, fish-hooks, and pincers : also a whole necklace of coloured glass beads, chiefly white and red ; a great many fragments of hair (combs, some very well engraved, with crossing straight lines, circles, and dots. They were all formed of bone.

On the following day was discussed the question of how the age of Iron was characterised in Sweden, and an attempt was made to establish the relations at that period which existed between the Swedes and the more southern nations ; but, just as on some of the other occasions, no definite conclusion was arrived at, and this arose from the great tendency members showed for discussing the details instead of keeping to the main subject. The last question considered was, what were the anatomical and ethnical characters of the prehistoric men in Sweden ? This afforded a second opportunity to the Congress of hearing an interesting passage of arms between Messrs. Virchow and Quatrefages, very similar in substance to what we had from them in print the year after the Franco-German war. They agreed to differ then, and they agree to differ still. It was interesting, but not to the point. However, all ended amicably, and the seventh session of the International Prehistoric Anthropological and Archæological Congress may be said to have terminated by an evening party given by the King of Sweden to all its members at his country palace of Drottningholm, on Saturday, August 15, 1874. Her Majesty and the Queen Dowager were both present. This evening party will long remain in the memory of the members of the Congress as a pleasant tribute of royalty to the shrine of science, reflecting as it does as much credit on the intellectual acumen of him who gave it as honour on those who received it.

The next meeting of the International Prehistoric Anthropological and Archæological Congress will be held at Pesth in 1876.

GEORGE HARLEY

ARMSTRONG'S "ORGANIC CHEMISTRY"

Introduction to the Study of Organic Chemistry. The Chemistry of Carbon and its Compounds. By Henry E. Armstrong, Ph.D., F.C.S. (London : Longmans and Co., 1874.)

TO write a good introduction to any subject is sufficiently difficult, but if the subject be developing very rapidly and undergoing very marked changes, as is the case with organic chemistry, obviously the difficulty of presenting such a subject to a student in a satisfactory manner is vastly increased. Dr. Armstrong has devoted

himself heart and soul to his work : the requisite knowledge he evidently possesses, and he has shown good judgment in selecting from much new matter what to bring forward and what to withhold. Neither in arrangement nor in substance has he made direct use of previous treatises on the subject ; he has written his own book on organic chemistry, and it certainly will prove to be a good and useful one.

No treatise of note on this subject had appeared of late years in our language, and this rapidly developing branch of science had outgrown the old form in which it had been cast. The change of name which has been suggested is really indicative of the change the science has undergone : formerly it was Organic Chemistry ; now it is the Chemistry of the Carbon Compounds ; in fact, formerly it was the properties of a few substances, the direct products from organised structures, which was studied, whereas now a very large portion of a treatise on organic chemistry is taken up with the exposition of the theoretical constitution of artificially prepared bodies. In few branches of science has theory been more useful and productive of more good than in this branch of chemistry ; and certainly inorganic chemistry, although dealing with simpler bodies, owes much to lessons derived from the organic branch of the subject.

Dr. Armstrong has grouped his subjects in a simple, and, if in somewhat a summary, still in a philosophic way. He casts off and entirely ignores all bodies which at present refuse to fall into some established group. Thus, such bodies as the natural organic alkaloids, indigo, albumen, &c., find at present no place in his book ; while we do not regret the exclusion of bodies of doubtful composition, unknown constitution, and but little special interest, still, to ignore the whole of the well-defined class of natural alkaloids was hardly necessary as a matter of principle, and certainly will prove inconvenient to the student.

Since this special property of carbon, this power which it has of combining with itself, appears capable of yielding an almost infinite number of compounds, the classification of this host of bodies becomes a matter of the first importance. So few were the number of organic bodies known only some forty years ago, that they could be classed according to their origin as vegetable or animal substances ; afterwards there sprung up a multitude of bodies formed directly or indirectly from these, and we have the first indication of those series of bodies which are now so characteristic of organic chemistry. More or less of the old principle of grouping has lingered in the science until now, but in this book it gives way entirely to grouping dependent solely on constitution ; some of the many series of organic bodies are now tolerably complete, and the discovery of new bodies, instead of as formerly tending to complicate the science, now tends to simplify it. In this arrangement of the compounds in series, Dr. Armstrong introduces a simplification which is important ; he does away with the aromatic group of compounds as a distinct group, and merges them in the larger general groups. This aromatic group of compounds, as they have been designated, have undoubtedly very marked and specific properties, but Dr. Armstrong shall state for himself his reasons for giving up the exclusion of them from the general series to which they may be considered as

belonging, and we think most chemists will be inclined to agree with him :—

"The division of carbon compounds into two great groups of fatty and aromatic substances, which has found favour of late years, has not been adopted. It appears to have arisen from the comparison of single substances, and cannot be sustained, I believe, if whole series are contrasted. It is now placed beyond doubt that in each homologous series of carbon compounds the properties (physical and chemical) of the successive terms undergo from first to last a progressive modification, and there is every reason to believe that in like manner the successive terms in each isologous series undergo a progressive modification. At present we are not acquainted with a single complete homologous or isologous series, so that it is difficult to draw conclusions ; but to judge from the evidence at our disposal it appears highly probable that the modification in properties from term to term of each homologous and isologous series is of so gradual a character that continuity may be said to exist throughout. If so, it is as little possible to divide carbon compounds into two great groups as it is to draw a line which shall sharply divide so-called inorganic and organic compounds ; that such a division appears possible at present is simply the consequence of the number of links which are still missing in the chain of facts."

While speaking of certain innovations which Dr. Armstrong has introduced into his book, the substitution of the term "unit weight" for combining or atomic weight should be noted : the term certainly has the advantage of being free from all theoretical significance ; but if the term *atom* is objected to, the term *combining weight*, already in common use, would, we should have thought, so nearly have expressed Dr. Armstrong's meaning as to save the necessity of introducing a new term. The general arrangement of the book is clear and simple. The first chapter deals with the methods of organic analysis ; and should any student be so unfortunate as not to have the opportunity of learning from experiment how organic bodies are analysed, certainly if he reads this chapter he will be well able to picture to himself the kind of way in which the determinations are made. The explanation of the use and meaning of formulæ naturally follow the determination of the data on which they rest. The following caution to students is not uncalled for, and cannot be too strongly impressed upon them. The author says, speaking of rational, constitutional, and structura formulæ : "The use of these terms seems to imply, however, that such formulæ express the constitution or structure of the bodies to which they refer ; but we must guard ourselves most carefully against this impression, since, hypothesis aside, we possess no real knowledge as to the internal constitution of chemical compounds, or of the mode of arrangement of the atoms of which bodies are presumed to be made up ; and although rational formulæ may represent the approximate constitution of chemical compounds, yet in the present state of our knowledge it is advisable to regard them simply as condensed symbolic expressions of the chemical nature and mode of formation of the compounds represented ; they enable us, so to speak, to decipher at a glance the chemical history of compounds."

The second chapter is devoted to the classification of

organic compounds, and Dr. Armstrong arranges them all under the following nine heads:—Hydrocarbons, Alcohols, Ethers, Aldehydes, Ketones, Acids, Anhydrides, Amines, and Organic-Metallic Bodies. To each class he devotes a few lines of explanation; in fact, the whole chapter is a general outline of what is to follow, and is very useful as giving a general and comprehensive view of the whole subject. The kind of action exerted by the most important reagents on organic bodies is next described, and will be useful to the student who already has some knowledge of the bodies acted on. After thus disposing of these introductory matters, the systematic study of the different classes of bodies above named is commenced and carried through, chapter by chapter, nearly in the above order, the study of Carbon itself forming the starting-point.

The book will certainly prove of great use in this country and do good service in extending a knowledge of organic chemistry. Students in general will hardly look upon it as an interesting text-book; long lists of rare substances, whose only real interest at present is in their constitution, cannot be made very attractive. The descriptions, however, of important methods of preparation and of purification of different bodies are very well given, and there is a reality and freshness about them which is not generally met with in systematic works on organic chemistry. Dr. Armstrong has evidently not been content to obtain all his information second hand.

The book will probably become the standard textbook on organic chemistry in this country, and in future editions probably will develop into a larger work; at present even it contains much detail, and is suited rather for the advanced student than for the mere beginner.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

Mr. Herbert Spencer and Physical Axioms

IN my letter, published in NATURE, vol. x. p. 104, I asked the following question—Does Mr. Spencer regard the second law of motion as an “unconsciously-formed preconception,” or as a “corollary of a preconception,” or as a “consciously-formed hypothesis”?

This led to a correspondence with Mr. Spencer, which he has thought well to publish, with comments, as part of a pamphlet containing appendices to his former pamphlet entitled “Mr. Herbert Spencer and the British Quarterly Reviewer.” Consequently, I should be glad if you would allow me space for a few final words to state what now appears to be the result of the controversy.

By the fuller explanation with which Mr. Spencer has favoured me, it has now been made clear that, on his theory of the evolution of physical axioms, the second law of motion is not itself a “preconception,” but a “corollary of a preconception,” that is, a truth implied in, but only evolved by conscious mental processes from, the preconception; though he afterwards somewhat qualifies this statement by admitting conscious *observation* to have its share in the result, when he says, “Observation aids in disentangling the truth that this relation between force and motion is more distinct where the actions are simplest—so leading to the intuition that the proportionality is absolute where the simplicity is absolute.” I state this, in fairness to Mr. Spencer, because he lays stress on the distinction, and rightly so from the point of view of psychological theory; though as regards my argument that the second law of motion is not to be regarded as in any sense an *a priori* cognition, it is a side issue of no importance.

But with respect to the main issue, I have at length obtained a definite reply in a passage which I proceed to quote from Mr. Spencer’s comments on my last letter to him. I had said—“Various hypotheses as to the relation between force and change of motion may be made, all consistent with the general preconception of the proportionality of cause and effect, and between which the mind alone is unable to decide, until it calls to its aid conscious observation or experiment.” To which Mr. Spencer rejoins—(the italics are mine)—“This is perfectly true. I have said nothing to the contrary. My argument implies nothing to the contrary. *I am not concerned with the question how impressed force is to be measured, or how alteration of motion is to be measured.* The second law of motion is a *purely abstract statement, and I hold it to be à priori only in its abstract form.* It asserts that the alteration of motion (a right mode of measurement being assumed) is proportional to the impressed force (a right mode of measurement being assumed). I do not affirm that we know, *à priori*, in what terms of space and time and mass change of motion is to be expressed. The law, as formulated, leaves this unspecified; and all I hold to be *à priori* is that which is alone stated in the law.”

To the mathematician and physicist, comment on this is hardly necessary. I was right when I said, in a former note, that there is little left to argue about. The osteologist may doubtless for his own purposes speak of the skeleton of a horse as a horse, though the dry bones would be a sorry substitute for the living animal to a man who wanted it to do his work. And so, too, Mr. Spencer, as a psychologist, might (if it did not lead to that disastrous confusion which we have complained that his use or misuse of the terms of physical science does lead to) speak of the second law of motion “in its abstract form” as the second law of motion; but assuredly Newton, who had carefully defined quantity of motion and of motive force before enunciating his “Axiomata sive Leges Motūs,” did not regard it as a “purely abstract statement;” and every mathematician and physicist, who has to any extent followed in Newton’s steps, knows that all that gives life and force—that is, power to generate new results and to co-ordinate and explain the external phenomena with which physics is concerned—to this or any other physical axiom is not its *à priori* basis or abstract form, but that element in it which has been derived from conscious observation or experiment.

The upshot of the whole controversy, then, is that the physical axioms of Mr. Spencer are not the living truths which form the basis of the physical sciences, but the bare abstract forms in which those truths may conveniently—possibly Mr. Spencer would say *must*—be expressed. I trust that the value of this result, to the readers of Mr. Spencer’s first principles, may be some atonement for the space and time which the controversy has occupied.

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Darwin on “The Origin of Life”

WE are constantly meeting with an objection to Mr. Darwin’s writings, urged alike by friends and foes, on the score of his not having published his views concerning the origin of life. As this objection refers to a matter of literary taste rather than to anything of substantial importance, in ordinary cases it is best met by silence; but when a President of the British Association gives it a prominent position in his inaugural address, it is time that a dissentient view should be raised.

Towards the close of his discourse, Dr. Tyndall observes:—“The origin of life is a point lightly touched upon, if at all, by Mr. Darwin and Mr. Spencer. Diminishing gradually the number of progenitors, Mr. Darwin comes at length to one ‘primordial form;’ but he does not say, as far as I remember, how he supposes this form to have been introduced. He quotes with satisfaction the words of a celebrated author and divine who had ‘gradually learnt to see that it is just as noble a conception of the Deity to believe He created a few original forms capable of self-development into other and needful forms, as to believe that He required a fresh act of creation to supply the voids caused by the action of His laws.’ What Mr. Darwin thinks of this view of the introduction of life I do not know. Whether he does or does not introduce his ‘primordial form’ by a creative act, I do not know. But the question will inevitably be asked, ‘How came the form there?’ . . . We need clearness and thoroughness here,” &c. Now, I submit that although this is a question which must “inevitably be asked,” it is nevertheless a question with which Mr. Darwin has nothing whatever to do. The problem concerning the origin of life is as distinct from